CLAIMS

1. A repeater for use in an undersea optical communication system, said repeater comprising:

a pressure vessel;

a frame, disposed within said pressure vessel, for holding optical signal amplification circuitry and other circuitry;

wherein said optical signal amplification circuitry includes at least 500 passive optical components packaged within said frame and which is interconnected by at least 1000 meters of optical fiber.

2. The repeater of claim 1, wherein said optical signal amplification circuitry includes at least 800 passive optical components.

3. The repeater of claim 1, wherein said optical signal amplification circuitry is interconnected by at least 2000 meters of optical fiber.

4. The repeater of claim 1, wherein said optical signal amplification circuitry and said interconnecting optical fiber are housed within a volume of less than about 0.14 m^3.

5. The repeater of claim 1, wherein said passive optical components include at least one of fiber bragg gratings, filters, combiners, couplers, isolators and photodiodes.

6. The repeater of claim 1, wherein said repeater draws more than 500 watts to power said optical signal amplification circuitry and other circuitry.

7. The repeater of claim 1, wherein said repeater draws more than 700 watts to power said optical signal amplification circuitry and other circuitry.

8. The repeater of claim 1, wherein said other circuitry includes at least one power supply.

9. The repeater of claim 1, wherein said other circuitry includes line monitoring circuitry.

10. The repeater of claim 1, wherein said optical signal amplification circuitry is Raman amplification circuitry.

11. The repeater of claim 1, wherein said Raman amplification circuitry includes more than 100 lasers in said repeater.

12. The repeater of claim 11, wherein said Raman amplification circuitry includes more than 200 lasers in said repeater.

13. The repeater of claim 1, further comprising:
at least one line quad module disposed within said frame, each line quad module providing for Raman amplification of optical signals associated with at least two fiber pairs.

14. The repeater of claim 13, wherein said repeater includes four of said line quad modules.

15. The repeater of claim 13, wherein said at least one line quad modules are not optically interconnected with one another.

16. The repeater of claim 13, wherein each of said line quad modules includes a plurality of line assemblies which are optically interconnected with one another.

17. The repeater of claim 16, wherein a plurality of pump lasers disposed in a first one of said plurality of line assemblies generate pump energy which is pumped into a first optical fiber associated with said first one of said

plurality of line assemblies and into a second optical fiber associated with a second one of said plurality of line assemblies.

18. The repeater of claim 1, wherein said optical signal amplification circuitry and said other circuitry are disposed on stacked, rectangular assemblies.

19. The repeater of claim 18, wherein each group of four stacked, rectangular assemblies are individually secured within said frame.

20. The repeater of claim 18 wherein said stacked, rectangular assemblies are disposed substantially parallel to a longitudinal axis of said pressure vessel.

21. The repeater of claim 1, further comprising:

a dielectric liner disposed between said pressure vessel and said frame.

22. The repeater of claim 21, wherein said dielectric liner has a breakdown voltage of greater than about 40 kV.

23. The repeater of claim 1, wherein said optical signal amplification circuitry includes a plurality of pump lasers, each of which generate pump energy at a predetermined wavelength, wherein a difference between a longest wavelength and a shortest wavelength of said plurality of pump lasers is greater than 90 nm.

24. The repeater of claim 23, wherein said pump energy from each of said plurality of pump lasers is combined and coupled to at least four optical fibers for amplifying optical data signals being carried by said at least four optical fibers.

25. An optical component tray comprising:

a plurality of cavities;

an area for winding optical fiber; and

at least one optical fiber guide groove extending between said area and each of said plurality of cavities.

26. The optical component tray of claim 25, further comprising:

a housing which substantially encloses said plurality of cavities, said area and said at least one optical fiber guide groove extending between said area and each of said plurality of cavities.

27. The optical component tray of claim 25, wherein said area includes at least one removable fiber winding tray.

28. The optical component tray of claim 27, wherein said at least one removable fiber winding tray includes at least two stacked fiber winding trays.

29. The optical component tray of claim 26, wherein said housing includes a plurality of openings proximate said area.

30. The optical component tray of claim 25, wherein said cavities are formed from a distendable material.

31. The optical component tray of claim 30, wherein said distendable material is an elastomer.

32. The optical component tray of claim 31 further comprising:

an elastomeric retaining device having said plurality of cavities formed therein, each of which is adapted to receive and frictionally retain an optical component.

33. The optical component tray of claim 32, wherein said elastomeric retaining device is formed as a series of alternating openings and at least partially hollow tubes, said alternating openings comprising said plurality of cavities.

34. The optical component tray of claim 27, wherein said removable fiber winding tray has at least some of said optical fiber guide grooves formed integrally therewith.

35. The optical component tray of claim 27, wherein said removable fiber winding tray has at least some of said plurality of cavities formed integrally therewith.

36. The optical component tray of claim 34, wherein said removable fiber winding tray further includes an elastomeric retaining device having at least some of said plurality of cavities formed therein, each of which is adapted to receive and frictionally retain an optical component.